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NOTES ON THE *ENTOMOGNATHUS*
OF EASTERN UNITED STATES
(HYMENOPTERA: SPHECIDAE)

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The species of the genus *Entomognathus* are among the least common of the crabronine wasps in the eastern United States. I have seen only 60 specimens of the four species occurring in this area, all of which belong to the subgenus *Toncahua* Pate. The two more common species in the Middle Atlantic States, *lenapeorum* Viereck and *memoralis* Banks, are sylvicolous forms which nest in rather heavy soil. A third species from Florida and possibly North Carolina, *arenivaga*, n. sp., occurs in open, sparsely vegetated sandy areas. The fourth species, *texanus* Cresson [= *panurgoides* Viereck, NEW SYNONYMY], ranges from Texas to Kansas and also has been taken in Pennsylvania; its habitat preferences are not known.

Nothing is known about the prey preferences of any of our Nearctic species. Perhaps they prey on adult halticine Chrysomelidae, as do certain of their Palaearctic congeners which belong to the typical subgenus. Presumably our species visit honeydew secretions of various insects for food. At least many of the specimens of *lenapeorum* and *memoralis* are labeled as having been taken on honeydew secretions and on oak foliage. However, one male of *memoralis* was collected on *Chrysanthemum Parthenium* Pers., which it may have visited for nectar.

The following key will separate the four species of *Entomognathus* (*Toncahua*) occurring in the eastern United States.

1. Large species (♀ ♀, 6.1-8.4; ♂ ♂, 5.5-7.3 mm); pale body markings lemon yellow; mesopleural disk not margined anteriorly by a vertical carina nor by a foveolate groove; posterior margin of only fourth and fifth terga shallowly emarginate in middle; a large,

shallow, oblique, supraorbital fovea present; Kansas south to Mexico (Tamaulipas), Pennsylvania *texana* Cresson
 Smaller species, ♀♀ not over 6.8 and ♂♂ not over 5.2 mm long;
 pale body markings ivory or whiter; mesopleural disk margined
 anteriorly by a vertical carina behind which is a foveolate groove;
 posterior margin of third to fifth terga shallowly emarginate in
 middle 2

2. Smaller species (♀, 3.7; ♂♂, 3.4–3.7 mm), occurring on sparsely
 vegetated, sandy areas in Florida and possibly North Carolina;
 propodeum dull, the posterior surface punctate laterad of median
 cuneate impression; mandible yellow at base, light red at apex;
 tarsi pale yellow; male with a short lateral ridge or elongate tubercle
 on sixth tergum, and third to fifth sterna with a transverse
 row of coarse, confluent pits, female with one blunt lateral tooth
 on median lobe of clypeus *arenivaga*, new species

Larger species (♀♀, 5.3–6.8; ♂♂, 4.2–5.2 mm), occurring in open
 wooded areas with heavy soil, Connecticut or New Jersey to
 Virginia, Kansas; propodeum shining, the posterior surface more
 or less irregularly rugulose reticulate on lateral areas, occasionally
 with a few scattered small punctures; mandible usually black at
 base, dark brown to dark red at apex, occasionally yellow sub-
 basally; tarsi infuscated entirely or in part; male without ridge
 or tubercle laterally on sixth tergum, and without such rows of
 pits on sterna; female with two acute lateral teeth on median lobe
 of clypeus 3

3. Slightly smaller (♀♀, 5.3–5.5; ♂♂, 4.5–4.8 mm), the punctuation
 relatively coarser and denser, particularly on mesopleuron and
 first two terga; fovea near upper inner margin of compound eye
 well developed, lenticular in outline; pronotal lobe in anterior
 aspect angulate laterally. FEMALE: Creamy markings as follows—
 scape beneath, pronotal tubercle, fore and mid tibiae except be-
 neath, fore basitarsus above, and basal two or three segments of
 mid and hind tarsi. MALE: Fore basitarsus strongly flattened,
 its apical width 0.5 the length, the posterior margin curved; mid
 basitarsus noticeably thickened on apical half when viewed from
 the front; creamy markings as follows—scape beneath, fore tibia
 with a stripe above, mid tibia with a narrower stripe on basal two-
 thirds, all basitarsi above and sometimes second segment of hind
 tarsus *lenapeorum* Viereck

Slightly larger (♀♀, 5.5–6.8; ♂♂, 4.2–5.2 mm), the punctuation
 relatively finer and sparser; supraorbital fovea obsolete; pronotal
 lobe in anterior aspect rounded laterally. FEMALE: Creamy mark-
 ings as follows—scape beneath, pronotal collar except in middle,
 pronotal tubercle, base of tegula, a pair of rounded lateral spots
 on scutellum, paired posterolateral oval spots on first four terga,
 fore femur at apex in front, fore tibia except beneath, stripe on

outer surface of mid tibia, and hind basitarsus above at base. MALE: Fore basitarsus not so strongly flattened, its apical width 0.3 the length, the posterior margin straight; mid basitarsus not abruptly thickened on apical half; creamy markings as follows—scape beneath, lateral spots on pronotal collar, pronotal tubercle, base of tegula, paired posterolateral oval spots on first two terga (those of second quite small) and rarely on third and fourth also, fore and mid tibiae except beneath, hind tibia above at base and along posterior margin, fore and mid basitarsi (the former above, the latter entirely), and three basal segments of hind tarsus -----

----- *memorialis* Banks

Entomognathus (Toncahua) arenivaga, new species

? *Entomognathus* sp., Brimley, 1938. The Insects of North Carolina, p. 450.

Entomognathus (Toncahua), n. sp., Krombein and Evans, 1954. Proc. Ent. Soc. Wash., 56: 235 (♀; Arcadia, Fla.).

E. arenivaga is quite easily distinguished from the other two species occurring in the eastern United States by its smaller size, dull and partially punctate propodeum, entirely pale tarsi, and in its preferred habitat (sparsely vegetated, sandy areas). At the present time it is known certainly by only a short series from the banks of the Peace River at Arcadia, Florida. Undoubtedly it is more widely distributed and may be found eventually in some of the adjacent Southeastern States when the small wasp fauna is more thoroughly explored. I have seen a male from Bryson City, N. C., which may be this species, although it differs in some details. The collection data indicate that there are two or more generations annually in peninsular Florida.

Type: ♂; Arcadia, DeSoto County, Florida; 30 June 1962 (K. V. Krombein) [U. S. National Museum, Type No. 66662].

Male: Length 3.5, forewing 2.8 mm. Black, the following creamy: Basal half of mandible, antenna beneath, pronotal tubercle, spot above at apex of fore femur, outer surface of fore and mid tibiae, base of hind tibia, and all tarsi. Apical half of mandible, tegula, narrow apical margins of first five terga, and last abdominal segment entirely, light red. Wings slightly infumated, stigma and veins brown.

Head shining, dense, appressed silvery hair on lower sides of face and on clypeus except just above apex of median lobe, the rest of head with short cinereous vestiture which is appressed on temple, erect on eyes, front and vertex; apical margin of median lobe of clypeus slightly rounded and with a small, blunt lateral tooth; lower half of face with fine dense punctures laterally, impunctate on a narrow median strip; upper part of face with delicate punctures mostly separated from each other by two to three times the diameter of a puncture; supraorbital fovea obsolete; ocelli in a low triangle, the ocellocular distance 0.8 times the postocellar distance; vertex with minute, more scattered punctures; temple with

minute, denser punctures; flagellum short, moderately clavate toward apex, none of segments modified.

Thorax shining except propodeum dull, the vestiture sparse, short, cinereous, erect on dorsum, decumbent on sides; pronotum not carinate anteriorly or on tubercle; scutum with irregularly scattered, small punctures, separated from each other by two to five times the diameter of a puncture; scutellum sparsely punctate, anteriorly with a deep, moderately broad foveate groove; postscutellum anteriorly with a narrower, shallower foveolate groove; mesopleuron anteriorly with a sharp carina behind which is a foveolate groove, episternal suture foveolate as is a vertical groove along posterior margin, the surface elsewhere with scattered, minute punctures and without a tubercle or carina before mid coxa; metapleuron with rather dense, minute punctures, margined posteriorly by a foveolate groove; propodeum short, dorsal surface in middle with a rectangular areole on each side of which are small irregular areoles; posterior surface with a median, more or less cuneate areole, on each side of which the surface is punctate and crossed by a few weak, transverse rugulae; lateral surface granulate, with longitudinal rugulae posteriorly.

Legs essentially unmodified, the fore tarsus flattened but not widened.

Abdomen shining, vestiture sparse, short and mostly appressed, apical margins of third to fifth terga arcuately emarginate in middle, those of fourth and fifth more noticeably so; first and second terga with fine punctures separated by two to three times the diameter of a puncture, the third and fourth terga with more scattered punctures; fifth tergum with punctures a little larger and closer; sixth and seventh terga with coarse, subcontiguous punctures, the sixth with a short lateral ridge, the seventh with a marginal carina; second sternum with moderately large punctures mostly separated by one to two times the diameter of a puncture; third to fifth sterna each with a transverse row of coarse, confluent pits across middle.

Allotype: ♀; Arcadia, Florida; 2 April 1953 (W. R. M. Mason) [Canadian Dept. Agr.].

Female: Length 3.7, forewing 3.0 mm. Color and vestiture as in male.

Head the same as in male, but with a narrow, sublunate supraorbital fovea; clypeal lobe with only one blunt lateral tooth.

Thorax the same but median rectangular areole of propodeal dorsum crossed by several weak rugulae.

Anterior tarsi without a comb.

Abdomen in general the same as in male, but pygidium with sides forming an angle of about 30° at apex, the surface with coarse, contiguous punctures and suberect setulae, and pits on sterna weaker, present only on third and fourth.

Paratypes: 3 ♂♂; same locality as type, but one each on 2, 3, and 4 July 1962 (K. V. Krombein). The paratypes range in length from 3.4 to 3.7 mm and are otherwise identical with the type. In addition, I have

seen a male from Bryson City, North Carolina, 20 August 1923 (J. C. Crawford) [N. C. Dept. Agr.], which may be this species. It agrees in all respects with the Florida males except that the mandible is dark at base, the pronotal disk has a tiny, lateral pale spot, and the sixth tergum lacks the lateral tubercle or ridge.

Entomognathus (Toncahua) lenapeorum Viereck

Entomognathus lenapeorum Viereck, 1904. Trans. Amer. Ent. Soc. 30: 239 (♀; Lehigh Gap, Pa.; type in Academy of Natural Sciences, Philadelphia).—Cresson, 1928. Mem. Amer. Ent. Soc. 5: 54.—Krombein, 1951. Ann. Ent. Soc. Amer. 44: 143 (♀, ♂; Dunn Loring, Va.).

Entomognathus (Toncahua) lenapeorum Viereck, Krombein in Muesebeck *et al.*, 1951. U. S. Dept. Agr., Agr. Monogr. 2: 1013.—Leclercq, 1954. Monogr. Crabroniens, p. 203.

This species and *memoralis* are obviously closely related and quite distinct from *arenivaga*. *E. lenapeorum*, as compared with *memoralis*, is a slightly smaller, somewhat less maculated species and has a well-developed supraorbital fovea. The pale markings vary less than in *memoralis*, possibly because fewer specimens are available. The tarsi are all dark in one female, and another female has a small, pale, postero-lateral spot on the first tergum. The male from Kansas has a small pale spot on the pronotal tubercle.

The available label data indicate that *lenapeorum* is double-brooded. Banks captured a male on May 30, and my series from Dunn Loring probably emerged just a few days before the dates of capture in early September.

Specimens examined: 10 ♀♀, 5 ♂♂, with the following data.

New Jersey: 1 ♀; Glassboro; 12 August 1942 (W. F. Rapp) [USNM].

Pennsylvania: 1 ♀; Lehigh Gap, 29 June 1901 [ANSP, the type]. 1 ♀; Hazelton; September 1896 (W. G. Dietz) (= Baker #, Pa. 2071) [USNM].

Maryland: 2 ♀♀, 2 ♂♂; Takoma Park; 20 June (♀) and 9 August 1942 (♀, 2 ♂♂) (H. and M. Townes) [HKT, KVK]. 1 ♀; Glen Echo; 30 August 1923 (J. R. Malloch) [USNM].

Virginia: 1 ♀; Falls Church; 30 May (N. Banks; on chinquapin) [MCZ]. 3 ♀♀, 2 ♂♂; Dunn Loring; 4 (♀♀) and 5 (♂♂) September 1949 (K. V. Krombein; visiting honeydew secretions of *Toumeyella liriodendri* (Gmel.) on foliage of *Liriodendron tulipifera* L. at edge of woods) [KVK].

Kansas: 1 ♂; Clay Co.; August 1901 (J. C. Bridwell) [USNM].

Entomognathus (Toncahua) memorialis Banks

Entomognathus memorialis Banks, 1921. Ann. Ent. Soc. Amer. 14: 16 (♀; Glencarlyn, Va.; type in Museum of Comparative Zoology, Cambridge).

Entomognathus (Toncahua) memorialis Banks, Krombein in Muesebeck *et al.*, 1951. U. S. Dept. Agr., Agr. Monogr. 2: 1013.—Krombein, 1952. Trans. Amer. Ent. Soc. 78: 95 (♀; Westmoreland State Park, Va.).—Leclercq, 1954. Monogr. Crabroniens, p. 203.

There is some variation in the extent of pale markings, but *memorialis* always has more pale markings than does *lenapeorum*. In less maculated *memorialis* females the scutellum is dark in one specimen, and the hind basitarsus is dark in two, whereas two females have a small, pale, posterolateral spot on the fifth tergum. The two males from Kansas are more brightly marked than eastern males; they have posterolateral pale spots on the first four terga. In a few less strongly marked eastern males the pale markings may be lacking on all terga as well as on the pronotal dorsum and hind tibia.

The available label data suggest that this species is definitely bivoltine in the Washington metropolitan area.

Specimens examined: 12 ♀♀, 11 ♂♂, with the following data.

Connecticut: 1 ♀; Cornwall [MCZ].

New Jersey: 1 ♂; Ramsey; 16 June 1916 (on *Chrysanthemum Parthenium pinnatifidum* Lec. and Lam.) [USNM].

Maryland: 2 ♀♀, 2 ♂♂; Plummers Island; 28 June 1958 (♂; K. V. Krombein; on oak foliage), 3 July 1921 (2 ♀♀; J. Bequaert; one nesting in ground along woodland path), and 4 July 1961 (♂; K. V. Krombein; on oak foliage) [KVK, USNM].

District of Columbia: 4 ♀♀; 26 June 1949 (D. G. Shappirio), 27 June 1944 (M. Vogel), 11 July 1916 (H. L. Viereck), and 22 August 1903 (J. C. Bridwell) [DGS, USNM].

Virginia: 1 ♀, 1 ♂; Glencarlyn, Arlington Co.; 28 June (♂; N. Banks) and 26 July (♀; type of *memorialis*; N. Banks) [USNM, MCZ]. 1 ♂; Arlington; 11 July 1954 (K. V. Krombein) [KVK]. 1 ♀, 1 ♂; Falls Church; June 1916 (J. N. Knull) [USNM] and 2 June (N. Banks) [MCZ]. 1 ♀, 3 ♂♂; Dunn Loring; 15 and 28 July 1951 (2 ♂♂; visiting honeydew of *Toumeyella liriodendri* (Gmel.) on foliage of *Liriodendron tulipifera* L.), 24 July 1949 (♀) and 26 July 1947 (♂; on leaf of *Quercus montana* Willd.) (all K. V. Krombein) [KVK]. 1 ♀; Mt. Vernon; 4 July 1917 (W. L. McAtee; on honeydew) [USNM]. 1 ♀; Westmoreland State Park; 6 July 1951 (K. V. Krombein; on honeydew of *Toumeyella liriodendri* (Gmel.) on *Liriodendron tulipifera* L.) [KVK].

Kansas: 2 ♂♂; Baldwin; 10 July and 9 August 1906 (J. C. Bridwell) [USNM].

Entomognathus (Toncahua) texana Cresson

Entomognathus texanus Cresson, 1887. Trans. Amer. Ent. Soc., Sup. Vol., p. 286 (♀, ♂; Texas; type in Academy of Natural Sciences, Philadelphia).—Fox, 1895. Trans. Amer. Ent. Soc. 22: 132.—Dalla Torre, 1897. Cat. Hym. 8: 631 (erroneously placed *E. texanus* Cr. in synonymy of *Crabro texanus* Cr.).—Cresson, 1916. Mem. Amer. Ent. Soc. 1: 103.

Anothyreus panurgoides Viereck, 1904. Trans. Amer. Ent. Soc. 30: 239 (♂, ♀ misdet.; lectotype, Lehigh Gap, Pa.; Academy of Natural Sciences, Philadelphia).—Cresson, 1928. Mem. Amer. Ent. Soc. 5: 55. NEW SYNONYMY.

Entomognathus (Toncahua) texana Cresson, Pate, 1944. Amer. Midl. Nat. 31: 341 (*texanus* cited as genotype of *Toncahua*, n. subg.).—Krombein in Muesebeck *et al.*, 1951. U. S. Dept. Agr., Agr. Monogr. 2: 1014.—Leclercq, 1954. Monogr. Crabroniens, p. 203.

Entomognathus (Toncahua) panurgoides (Viereck), Krombein in Muesebeck *et al.*, 1951. U. S. Dept. Agr., Agr. Monogr. 2: 1014.—Leclercq, 1954. Monogr. Crabroniens, p. 203.

Viereck described *Anothyreus panurgoides* from one female and one male but neglected to select a type. His description of the female (actually labeled ♂ in error in the description) is first, and is followed by the description of the male. The female is actually a specimen of what was described later as *Crabro (Crabro) junatae* Krombein, but the male is a true *Entomognathus* and a specimen of *texana* Cresson. Viereck must have based his generic assignment of *panurgoides* on the female, and probably would have selected that sex as type had he made a selection. Viereck's assignment of a male *Entomognathus* as the opposite sex of *panurgoides* is inexplicable, particularly because of his correct generic assignment of *Entomognathus lenapeorum* on the preceding page. However, Cresson's designation of the male as lectotype of *panurgoides* makes it necessary to apply the name as I am doing here. I have seen both Viereck's lectotype and Cresson's type, and I regard them as being conspecific.

This is the only known species of *Toncahua* in which the mesopleural disk is not margined anteriorly by a sharp carina and foveolate groove. It is more brightly marked than any of the other three species treated here. The pale markings are lemon yellow as contrasted to the ivory or whiter markings of the other eastern species. Usually the clypeus has a median yellow spot, and the mandible is yellow at the base. The western specimens vary to some degree in the extent of the pale markings, but they are all more brightly marked than the male lectotype of *panurgoides* from Pennsylvania. Additional eastern material may demonstrate the desirability of recognizing the eastern population as a distinct race, *texana panurgoides*.

Specimens examined: 7 ♀♀, 9 ♂♂, with the following data.

Pennsylvania: 1 ♂; Lehigh Gap; 26 June 1901 [ANSP, the lectotype of *panurgoides*].

Kansas: 1 ♂; Clay Co. [USNM]. 1 ♀; Decatur Co., 2,560 ft. (F. X. Williams) [KU]. 1 ♂; Cowley Co., 1,114 ft.; 1916 (R. H. Beamer) [KU].

Oklahoma: 1 ♀, 1 ♂; Ardmore; 1 June 1909 (F. C. Bishopp) [USNM].

Texas: 2 ♀♀, 1 ♂; no other data (Belfrage) [ANSP, the ♀ type of *texana*; 1 ♀, 1 ♂, USNM]. 1 ♀; Progreso; 12 April 1950 (Michener, Rozens, Beamers, Stephen) [KU]. 1 ♂; 5 mi E of Riogrande; 12 April

1950 (Beamers, Stephen, Michener, Rozens; on *Quincula lobata* (Torr.)) [KU]. 2 ♀ ♀, 2 ♂ ♂; Brownsville; 19 and 25 March 1945 (1 ♀, 2 ♂ ♂; D. E. Hardy), and 21 June 1945 (1 ♀; on cotton) [USNM].

Mexico: 1 ♂; Victoria, Tamaulipas; 10 December (F. C. Bishopp) [USNM].